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Wolbers, M.H.J.

published in
International Review of Education
2005

DOI (link to publisher)
10.1007/s11159-005-0664-z

document version
Publisher's PDF, also known as Version of record

Review of Education (2005) 51:459–478
DOI 10.1007/s11159-005-0664-z

INITIAL AND FURTHER EDUCATION: SUBSTITUTES OR COMPLEMENTS? DIFFERENCES IN CONTINUING EDUCATION AND TRAINING OVER THE LIFE-COURSE OF EUROPEAN WORKERS

MAARTEN H. J. WOLBERS

Abstract – This investigation examines the place of initial and further education in continuing education and training over the life-course of workers across Europe. The evidence presented demonstrates that in countries with a strong orientation towards vocational education, participation in continuing education and training among employees is higher than in countries that mainly provide general education. Moreover, it can be seen that the effect of the vocational orientation of the education system increases over the life-course of workers. The conclusion of this investigation is that further education complements rather than substitutes for initial education. This implies that national education and training policies meant to encourage lifelong learning should not only attempt to expand or redirect training received by already experienced workers, but also try to facilitate participation in initial vocational training.

Zusammenfassung – ERSTAUSBILDUNG UND WEITERBILDUNG: ERSATZ ODER ERGÄNZUNG? UNTERSCHIEDE BEI DER WEITERFÜHRENDEN BILDUNG UND AUSBILDUNG IM LAUFE DES LEBENS VON EUROPÄISCHEN ARBEITERN – Diese Untersuchung prüft den Stellenwert von Erstausbildung und Weiterbildung bei der weiterführenden Bildung und Ausbildung im Laufe des Lebens von Arbeitern in Europa. Der vorgestellte Befund zeigt, dass in Ländern mit einer starken Orientierung in Richtung der beruflichen Ausbildung die Teilnahme an weiterführender Bildung und Ausbildung unter Arbeitnehmern höher ist als in Ländern, welche in der Hauptsache allgemeine Bildung bereitstellen. Überdies kann gesehen werden, dass die Auswirkung der beruflichen Orientierung des Bildungssystems im Laufe des Lebens der Arbeiter ansteigt. Die Schlussfolgerung dieser Untersuchung ist, dass weiterführende Bildung eher die erste Bildung ergänzt als ersetzt. Das impliziert, dass nationale Bildungs- und Ausbildungs-Politik, welche zum lebenslangen Lernen ermutigen will, nicht nur versuchen sollte, die Ausbildung, welche bereits erfahrene Arbeiter erhalten haben, zu erweitern oder in andere Bahnen zu lenken, sondern auch die Teilnahme an der beruflichen Erstausbildung zu erleichtern.

Résumé – ÉDUCATION PREMIÈRE ET POSTSCOLAIRE : SUBSTITUTS OU COMPLÉMENTS ? LES DIFFÉRENCES DANS L'ÉDUCATION CONTINUE ET DANS LA FORMATION TOUT AU LONG DE LA VIE CHEZ LES TRAVAILLEURS EUROPÉENS – Cette enquête examine la place de l'éducation première et postscolaire dans l'éducation continue et dans la formation tout au long de la vie des travailleurs à travers l'Europe. L'argument présenté ici démontre que dans les pays avec une forte orientation vers l'éducation vocationelle, la participation à l'éducation et à la formation continues parmi les employés est plus élevée que dans les pays qui ne

fournissent principalement qu'un accès à une éducation générale. En outre, on peut constater que l'orientation professionnelle du système éducatif va en augmentant tout au long de la vie des travailleurs. La conclusion de cette enquête est que l'éducation postscolaire est un complément plutôt qu'un substitut à l'éducation première. Ceci implique que l'éducation nationale et les politiques de formation, dont l'intention est d'encourager l'apprentissage tout au long de la vie, ne devraient pas seulement essayer d'étendre ou de rediriger la formation reçue par des travailleurs déjà expérimentés, mais devraient aussi tenter de rendre plus facile la participation à une formation professionnelle première.

Resumen – EDUCACIÓN INICIAL Y SUBSIGUIENTE: ¿SUSTITUTOS O COMPLEMENTOS? DIFERENCIAS EN EDUCACIÓN PERMANENTE Y FORMACIÓN Y CAPACITACIÓN PROFESIONAL DURANTE TODA LA VIDA DE TRABAJADORES EUROPEOS – Este trabajo investiga el lugar que ocupan la educación inicial y la educación subsiguiente en la formación y la capacitación profesional a lo largo de toda la vida de los trabajadores de Europa. Los resultados presentados demuestran que en aquellos países con marcada orientación hacia la formación profesional, la participación en la formación y la capacitación permanente entre los empleados es mayor que en aquellos países que, en mayor parte, proveen una educación general. Además, se puede ver que los efectos de una orientación profesional del sistema educativo se van pronunciando a lo largo de la vida de los trabajadores. El estudio llega a la conclusión de que la educación subsiguiente es más un complemento que un sustituto de la educación inicial. Esto implica que las políticas educativas nacionales tendientes a incentivar a un apredizaje durante toda la vida no solamente deberían tratar de ampliar o reorientar la formación recibida por trabajadores ya experimentados, sino que también deberían tratar de facilitar la participación en una formación profesional inicial.

Резюме – НАЧАЛЬНОЕ И ДАЛЬНЕЙШЕЕ ОБРАЗОВАНИЕ: ЗАМЕНА ИЛИ ДОПОЛНЕНИЕ? РАЗЛИЧИЯ МЕЖДУ НЕПРЕРЫВНЫМ ОБРАЗОВАНИЕМ И ПРОФЕССИОНАЛЬНОЙ ПОДГОТОВКОЙ НА ПРОТЯЖЕНИИ ЖИЗНИ РАБОЧИХ В ЕВРОПЕ – Данное исследование рассматривает место начального и дальнейшего образования в непрерывном образовании и профессиональной подготовке на протяжении жизни рабочих в Европе. Предоставленные данные показывают, что в странах с сильной ориентацией на профессиональное образование участие в непрерывном образовании и профессиональной подготовке среди служащих выше, чем в странах, которые в основном предлагают общее образование. Более того, можно отметить, что значение профессиональной ориентации образовательной системы все больше возрастает на протяжении жизни рабочих. В данном исследовании автор приходит к выводу о том, что дальнейшее образование дополняет, а не заменяет начальное образование. Это означает, что национальная политика образования и профессиональной подготовки, направленные на поощрение обучения на протяжении всей жизни, должна не только пытаться расширять или перенаправлять обучение, полученное уже опытными рабочими, но также и пытаться облегчать их участие в начальной профессиональной подготовке.

Increasing globalisation and competitiveness, combined with rapid technological changes, have made education and training in modern societies more important in the social stratification process and as an economic growth factor (OECD 1998). While formal qualifications in initial education are one aspect of this, attention has become more focused on the significance of continuing education and training for those who have already finished initial education and are working. The function of continuing education and training has often been associated with the idea of lifelong learning. In current knowledge societies, where technological developments follow each other rapidly, the risk of skills becoming obsolete is relatively high, and participation in continuing education and training is used to maintain and develop (new) skills (see Bartel 1991; Miles and Ducatel 1994; Tuijnman 1997; de Grip and van Loo 2002).

An important issue here is whether the nature and scale of continuing education and training depend upon the nature and scale of initial pathways to work (OECD 2000: 143). Formulated differently: To what extent are initial and further education complements or substitutes? For example, does the strength of initial vocational education in countries with an extensive system of apprenticeship programmes reduce the need for continuing education and training, or does it complement it? To adequately answer these questions, this study investigates differences in continuing education and training participation over the life-course of workers across Europe. For this purpose, it makes use of the European Union Labour Force Survey (EU LFS) dataset for the period 1993–2001. Although this dataset is not collected with a particular emphasis on continuing education and training, it constitutes one of the best sources now available to analyse lifelong learning cross-nationally due to its scale and comparability between countries.

The present contribution to the literature on lifelong learning has two important features. First of all, it extends the study of lifelong learning beyond the borders of a single country. While there is a vast body of empirical studies about initial education prior to labour market entry, internationally comparative research on continuing education and training is extremely limited (O'Connell 1999; Arulampalam et al. 2004). Second, the international approach allows us to pay attention to the effect of institutional arrangements, which are largely constant within countries but vary between countries (OECD 1999). In particular, it is important to understand how institutional differences in the organisation and set-up of systems of initial education facilitate or hinder investments in lifelong learning among the employed labour force.

The study is structured as follows. In the next section, we derive some hypotheses on differences in continuing education and training participation over the life-course of workers across Europe related to differences in the vocational orientation of national systems of initial education. The third section describes the data, variables and statistical method used in analysing cross-national variation in training participation. The fourth section presents

estimation results with regard to training participation based on multilevel analysis. The fifth section presents the main conclusions of the study.

Theoretical background

Further education: Substitute ...

The pronounced differences between European countries in their institutional arrangements with respect to the education system and the labour market lead to the expectation that there are considerable differences in the attention paid to lifelong learning across Europe. In particular, it can be assumed that participation in continuing education and training is related to the extent to which there is an institutional link in a country between the system of initial education, on one hand, and, on the other, labour market institutions (Allmendinger 1989; Kerckhoff 1995; Müller and Shavit 1998). Basically, this refers to the extent to which national systems of initial education differentiate between general and vocational education. This differentiation is gradual, referring to an ideal type representing an underlying continuum rather than a simple dichotomy between general and vocational education. Some countries offer mainly general education. In such countries, education is weakly related to the workplace, and newcomers start in entrance jobs ('ports of entry'). Occupation-specific skills are obtained primarily by means of on-the-job training. In other countries, occupation-specific skills are often already taught in initial (apprenticeship-type or school-based) vocational education. Here, the link between the education and employment system is much closer. Access to skilled jobs is reserved for those workers who have mastered the specific skills needed for these jobs. Hence, the strong orientation towards initial vocational education makes participation in continuing education and training less necessary in these countries, as opposed to countries where further education is a compensation for the deficiencies of initial education (Crouch et al. 1999: 145). Our first hypothesis, therefore, states that in countries with a strong orientation towards initial vocational education, the participation in continuing education and training among the employed labour force is lower than in countries that mainly provide general education (*hypothesis 1*).

... or complement?

For all that, it is known that continuing learning opportunities for adults have long been part of the education system of countries with a strong orientation towards initial vocational education (OECD 2000: 139–140). These training opportunities (such as the *Meister* and *Techniker* qualifications in manufacturing in Austria, Germany and Switzerland) are open for individuals with upper-secondary vocational education and who have a few years of

labour market experience. The purpose of this continuing vocational training is to maintain interest in learning among workers with apprenticeship training or an equivalent school-based vocational qualification during their first years in the labour market. Although this kind of continuing education and training is selective, in the sense that low-skilled workers are excluded from such further education and training, it allows at least a relatively large group of (young) adults to systematically gain credit for the skills acquired through these programmes. In addition, (part-time) enrolment in (non-university) tertiary education after completion of upper-secondary vocational education has increased recently in countries with an extensive system of initial vocational education. In Germany, for instance, an increasing proportion of young people enter university after completing an apprenticeship (Hillmert and Jacob 2003). In the Netherlands, a rising percentage of school-leavers from upper-secondary vocational education (MBO) continue in higher vocational colleges (HBO) (van der Velden and Wolbers 2004). In Austria and Switzerland, non-university institutions (*Fachhochschulen*) were created as a vocational-oriented counterpart to theory- and research-oriented universities in order to attract former apprentices with a double qualification for both work and tertiary study. This parallel segmentation of the tertiary education system had been established earlier in Germany, the Netherlands, Denmark and Norway (Müller and Wolbers 2003). Based on these latter arguments, we deduce as an alternative hypothesis that in countries with a strong orientation towards initial vocational education, the participation in continuing education and training among the employed labour force is in fact higher than in countries that mainly provide general education (*hypothesis 2*).

Changes over the life-course of workers

Although these competing hypotheses are formulated for the employed labour force as a whole, there are different arguments suggesting that the impact of the vocational orientation of the education system on further education varies over the life-course of workers. In the first instance, given the assumption that further education can be regarded as a substitute, the 'remedial' effect of continuing education and training in countries focusing on general education implies that cross-national differences in training participation are mainly present at the beginning of the occupational career and diminish over the life-course of workers. In countries focusing on general education, investments in additional training among labour market entrants has primarily the function of bridging gaps that may exist between the skills in demand on the work floor and those that young workers possess (Barron et al. 1989). Once these vocational qualifications are obtained by means of specific enterprise-related training, skill deficiencies in initial education are compensated for and further investments in training become less necessary. Therefore, differences in training participation between countries that mainly provide general education and those

that are oriented towards initial vocational education are expected to decline over the life-course of workers (*hypothesis 3*).

A major assumption behind this hypothesis is that the labour-market value of a worker's human capital is constant over the occupational career, irrespective of how the vocational training is acquired (i.e., in initial versus further education). The question is, however, to what extent this assumption is fully justified. Since on-the-job training tends to be very firm-specific, the skills thus acquired may not be transferable in the case of inter-firm mobility and may become obsolete due to rapidly changing skill requirements (de Grip and van Loo 2002). By contrast, vocational training organized in initial education via schools or apprenticeships is much more standardized. As a result, the acquired skills are encoded into broadly recognized qualifications and are highly transferable across firms or even industries (Eyraud et al. 1990; Shavit and Müller 2000). Nevertheless, the German dual system of apprenticeship training has also been accused of not being flexible enough to adjust to recent occupational, technical and economic changes, most notably the employment shift from manufacturing to the service sector (Blossfeld 1992; Mayer 1995). The question is, however, whether the slow speed of adjustment of the dual system is reflected in a life-course effect. Given the relatively low occupational mobility in the German labour market and the static concept of an occupation (*Beruf*) there, the inflexibility of the dual system may instead mirror a cohort effect. In vocational programmes that are mainly occupation-specific, workers have the disadvantage of being restricted to narrowly defined occupational fields, and only new generations of entrants can be directed to new and future-oriented occupational fields (Blossfeld and Stockmann 1999: 9). Thus, it may be expected that investments in continuing education and training during the occupational career are more crucial for workers in countries where initial vocational education is less developed, which will counteract – at least to some extent – the expected decline in cross-national differences regarding training participation over the life-course of workers. Also, in support of the hypothesis that further education can be considered as a complement to initial education, we hypothesize that differences in training participation between countries decrease over the life-course of workers. Given the assumption that especially in countries where workers who obtain their occupation-specific skills by means of on-the-job-training run the risk of skills-obsolescence, investments in continuing education and training among the working population are more essential in order to stay employable during the career than in countries where occupation-specific skills are mainly acquired through initial vocational education. Therefore, we expect that the initial lead regarding training participation in countries in which the vocational orientation of the education system is stronger declines over the life-course of workers.

Research design

The data used in the empirical analysis that follows come from the European Union Labour Force Survey (EU LFS) dataset for the period 1993–2001. This dataset is a combination of the original Labour Force Surveys (LFS) held annually in the EU Member States and, due to its scale and its comparability between countries, constitutes an adequate source for analysing continuing education and training participation from a cross-national perspective. Although the intensity or prevalence of continuing education in the work force may take a variety of forms other than actual participation in continuing education and training, the data used do not enable analysis of other training aspects (such as training duration, specificity, location, costs, time and objectives). As an alternative, the International Adult Literacy Survey (IALS) as held in 12 OECD countries in 1994–1995 could have been used. Despite the fact that the IALS provides international comparable data on continuing education and training, including some training aspects other than actual training participation, in most countries the sample sizes are rather small, which limits the possibility to analyse subgroups – in this particular case age groups – within national populations (O'Connell 1999: 6–7). For that particular reason, we decided to use the EU LFS instead of the IALS.

We restrict the analysis to participation in continuing education and training of the employed labour force aged 15–64 years. A small modification to the regular ILO definition about the labour force is applied (see ILO 1990b). All people who were employed at the time of the survey, but who were in initial education at the same time (i.e., working students or young people participating in an apprenticeship programme) are excluded from the active labour force. Data from the years 1998 and 1999 are excluded from the empirical analysis due to lack of information on the type of occupation of workers. In addition, data from Austria, Sweden and Finland have only been available since 1995, due to their more recent membership in the European Union. Furthermore, for various reasons there are some other country-year combinations not included in the analysis. In Table A1 of the appendix an overview is given of the country-year combinations actually analysed. The figures in this table refer to the number of cases in each country-year combination.

Given the hierarchical data structure (with individuals nested in period-country combinations and period-country combinations nested in countries), the method used is multilevel analysis (see Snijders and Bosker 1999), which allows an adequate estimation of cross-national variation, variation within countries between individuals and variation within countries between periods being statistically controlled. In total, we provide estimates for five separate models in which only the intercept is allowed to vary randomly ('random intercept model'). We thus assume that all other parameters are constant over time and between countries. In the baseline model, we start with a description of the 'gross' variation in training participation between countries. In the

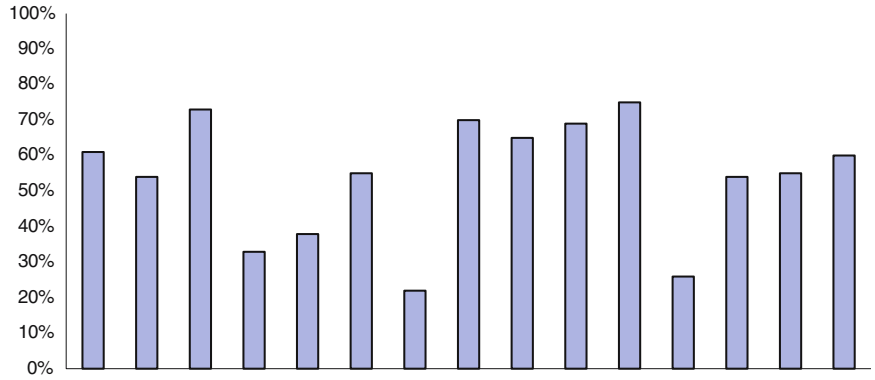
subsequent models, we try to interpret these country differences by taking into account the effects of the composition of the employed labour force, the general labour market situation, and a measure regarding the vocational orientation of the education system.

With regard to the composition of the employed labour force, we statistically control for age, year of labour market entry, level of education, sex, type of occupation and economic sector. Unfortunately, we are not able to control for firm size in the empirical analysis, since information on this variable, which is regarded as an important determinant of training participation, is not available in the dataset that is used in this article. Age is measured in age groups: 15–24, 25–34, 35–44, 45–54 and 55–64 years. Year of entry into the labour market is calculated as the sum of the year of birth and the age of leaving education. Age of leaving education is based on typical graduation ages as reported in OECD (1997). We defined the following labour market cohorts: 1948–1959, 1960–1969, 1970–1979, 1980–1989 and 1990–2001. Level of education is based on the International Standard Classification of Education (ISCED) (UNESCO 1975), namely below upper-secondary education (ISCED 0–2), upper-secondary education (ISCED 3–4) and tertiary education (ISCED 5–7). Sex differences are investigated by distinguishing men and women in the analysis. Type of occupation is measured on the basis of the first digit (major groups) of the ISCO–88 classification (see ILO 1990a). Economic sector is defined on the basis of the general industrial classification of economic activities (NACE Rev. 1) (EUROSTAT 1996). We here distinguish between the sections A–Q. The latter two variables are included in the analysis to take account of differences in the speed of technological change between sectors of industry and differences in the degree of skills-obsolescence between occupations, respectively. Although these two variables probably do not remove all the dynamics at work in the labour market (that requires a different kind of longitudinal data (true cohort data) and a different set of models (event history models)), they take at least large part of the structural features of labour market processes into account by applying a repeated cross-sectional (or synthetic cohort) approach, in which life-course and cohort effects are no longer perfectly collinear and the classical identification problem hence does not exist.

The general labour market situation at the time of the survey is controlled for by using the aggregate unemployment level in a country in a given year. The unemployment figures were published in OECD (2001).

Differences between countries providing fairly general education and countries offering more specific vocational education (i.e., cross-national differences in the vocational orientation of the education system) are indicated by a measure referring to the share of upper-secondary students in (apprenticeship type or school-based) vocational education in a country in a given year (EUROSTAT 2000, 2002; OECD 2003). In Figure 1, the mean score over the years 1993–2001 is given for each country. On average for the period under investigation, the share of upper-secondary students in vocational education varies between 22% for Ireland and 75% for Austria.

Figure 1. Share of upper-secondary students in vocational education by country, 1993–2001



Source: EUROSTAT 2000, 2002; OECD 2003.

Last but not least, training participation is measured by means of participation in continuing vocational training to advance or change one's working career (i.e., participation in initial education – including apprenticeship programmes – is excluded) in the last four weeks before the survey.

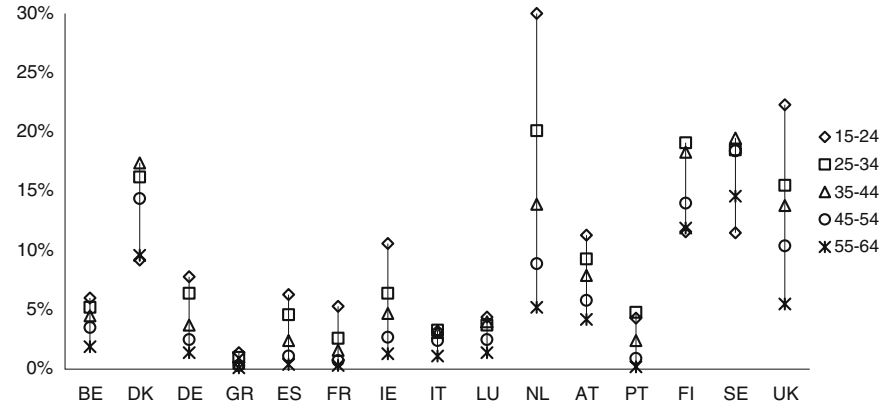
Results

Before presenting the estimation results of multilevel analysis, we start in Figure 2 with a description of cross-national differences in training participation over the life-course of workers. The figure shows that there is considerable variation across European countries with respect to participation in continuing education and training. Training participation among the employed labour force is highest in the Scandinavian countries of Sweden, Denmark and Finland and in the United Kingdom and the Netherlands. In Southern Europe (Italy, Spain, Portugal and Greece), France, Belgium and Luxembourg, on the other hand, investments in continuing education and training by workers do exist, but only marginally.

In addition, Figure 2 illustrates the decline in training participation in the sequence of age groups. In general, the highest point of each vertical line in the figure represents the proportion of training participation within the youngest age group, whereas the lowest point indicates the proportion within the oldest age group. Only in the Scandinavian countries do we find any deviation from this linear age pattern. Here, both the youngest and oldest age groups participate less in continuing education and training than the age groups in between.

Furthermore, it is interesting to note that the differences in training participation between European countries are smaller for older age groups than

Figure 2. Cross-national differences in training participation by age group, 1993–2001



Source: EU LFS 1993–2001, own calculations

for younger ones. For the oldest age group, the maximum difference in training participation is 15% (between Sweden and Greece). For the youngest age group the maximum regional disparity is 29% (between the Netherlands and Greece).

Table 1 presents the results of multilevel analysis regarding the likelihood of training participation. Model 0 gives an estimation of the variation between countries ('between-country variation') and the variation within countries between different periods ('within-country between-period variation'). Due to the dichotomous nature of the dependent variable, the variation at the individual level cannot be estimated and is therefore fixed at the value 1. Consequently, we are not able to estimate the extent to which this variation at the individual level can be attributed to the independent variables in the different models. The different variance components are displayed at the bottom of the table. The variance components of Model 0 display the gross variation between countries. The analysis shows that there are significant differences between countries in the likelihood of participating in continuing education and training (between-country variation is 0.741). There is also a significant variation within countries between different periods (0.034), but these differences are relatively small compared to the variation between countries.

The introduction of individual characteristics in Model 1 shows that the odds of participating in continuing education and training are strongly affected by the personal background of workers. First of all, training participation rates are lower for the older labour force. Part of this effect is a life-course or an age effect. Young workers participate more often in continuing education and training than do older ones. This finding confirms the results shown in Figure 2. However, another part of this effect is a cohort effect. Members of recent labour market cohorts receive relatively more training

Table 1. Logistic 3-level analysis of training participation: logit effects

Model	0	1	2	3	4
Intercept	−2.501**	−3.284**	−3.073**	−4.005**	−3.828**
Age group (ref. 15–24 years)					
25–34 years		−0.535**	−0.543**	−0.548**	−0.741**
35–44 years		−0.790**	−0.806**	−0.817**	−0.982**
45–54 years		−1.021**	−1.043**	−1.057**	−1.391**
55–64 years		−1.426**	−1.456**	−1.464**	−1.969**
Labour market cohort (ref. 1990–2001)					
1948–1959		−0.377**	−0.353**	−0.329**	−0.295**
1960–1969		−0.237**	−0.221**	−0.194**	−0.181**
1970–1979		−0.140**	−0.129**	−0.107**	−0.104**
1980–1989		−0.067**	−0.061**	−0.047*	−0.045*
Level of education (ref. below upper secondary)					
Upper secondary		0.486**	0.491**	0.493**	0.494**
Tertiary		0.672**	0.678**	0.686**	0.687**
Sex (ref. male)					
Female		−0.086**	−0.086**	−0.085**	−0.084**
Type of occupation (ref. elementary occupations)					
Armed forces members		0.839**	0.843**	0.833**	0.838**
Legislators, senior officials and managers		0.716**	0.719**	0.707**	0.709**
Professionals		1.025**	1.030**	1.017**	1.019**
Technicians and associate professionals		0.899**	0.903**	0.890**	0.892**
Clerks		0.659**	0.661**	0.654**	0.656**
Service workers and shop/market sales workers		0.574**	0.576**	0.571**	0.572**
Skilled agricultural and fishery workers		0.310**	0.308**	0.301**	0.306**
Craft and related trades workers		0.357**	0.358**	0.356**	0.359**
Plant and machine operators and assemblers		0.059*	0.060	0.058*	0.060*
Economic sector (ref. agriculture, hunting, forestry and fishing)					
Mining and quarrying		0.366**	0.368**	0.371**	0.371**
Manufacturing		0.394**	0.397**	0.397**	0.397**

Table 1. (Continued)

Model	0	1	2	3	4
Electricity, gas and water supply		0.840**	0.845**	0.839**	0.839**
Construction		0.147**	0.149**	0.150**	0.150**
Wholesale and retail trade, repairs		0.254**	0.257**	0.258**	0.258**
Hotels and restaurants		0.284**	0.286**	0.286**	0.286**
Transport, storage and communication		0.490**	0.493**	0.492**	0.492**
Financial intermediation		0.884**	0.889**	0.884**	0.884**
Real estate, renting and business activities		0.485**	0.488**	0.486**	0.487**
Public administration		0.844**	0.850**	0.842**	0.842**
Other services		0.833**	0.838**	0.832**	0.832**
Aggregate unemployment rate (%)			−0.024*	−0.029**	−0.029**
Share of upper-secondary students in vocational education (%/10)				0.182**	0.152**
Interactions between age group (ref. 15–24 years) and share of upper-secondary students in vocational education (%/10)					
25–34 years					0.032**
35–44 years					0.027**
45–54 years					0.054**
55–64 years					0.080**
Variance components					
Country level ($N = 15$)	0.741*	0.728*	0.738*	0.747*	0.752*
Period level ($N = 85$)	0.034**	0.028**	0.025**	0.018**	0.018**
Individual level ($N = 829{,}960$)	1.000	1.000	1.000	1.000	1.000
−2 log likelihood	488,622	426,473	424,271	379,422	378,822

*$p < 0.05$; **$p < 0.01$.
Source: EU LFS 1993–2001, own calculations.

than those who entered the labour market many years ago. This latter finding illustrates that training participation among the employed labour force has risen over time, reflecting the increased importance of lifelong learning in the last decades. Furthermore, Model 1 shows that those who have left education at the tertiary level are most likely to participate in continuing education and training. In terms of an odds ratio, their training participation is 1.958 ($e^{0.672}$) times higher than for individuals who left education with a diploma below upper-secondary education. Those who left education at the upper-secondary level hold an intermediate position. This pattern suggests that at the individual-level initial education and continuing education and training are complementary. Workers who are more educated receive more training than those with less education. In addition, Model 1 displays that female workers receive relatively less training than their male counterparts. The implied odds ratio is 0.918 ($e^{-0.086}$). Since women often combine labour market participation with care tasks in the family, the willingness of working women to receive training is reduced, because the periods when training investments can be made productive are shorter, which will lower the returns on their investment (Psacharopoulos 1987; Groot et al. 1988).

Besides individual characteristics, the likelihood of training participation is affected by job characteristics. First of all, there are substantial differences in the incidence of continuing education and training by type of occupation. Professionals stand out as the occupational group with the highest training participation rates, followed by technicians and associate professionals and – somewhat surprisingly – members of the armed forces. The lowest rates of training participation can be found in semi- or unskilled manual occupational groups: plant and machine operators and assemblers and elementary occupations. Second, rates of training participation differ between ecomomic sectors. Workers in agriculture, hunting, forestry and fishing receive less training than individuals employed in any other sector. Employers in the service sector (in particular those in financial intermediation, public administration and other services), on the other hand, are most likely to be trained. Also, workers in the industrial sector of electricity, gas and water supply receive relatively often continuing education and training.

Despite the significant impact of individual and job characteristics, these effects hardly affect the variance components at the country and period level. Compared to the baseline model, the variance at the country level decreases to 0.728 in Model 1; the variance at the period level decreases to 0.028.

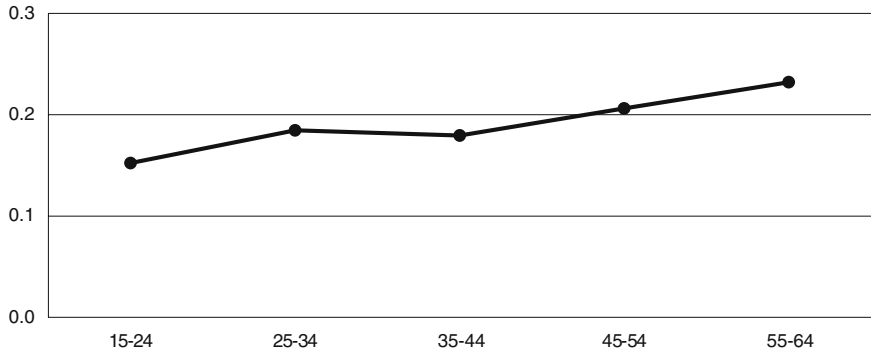
In Model 2, the general labour market situation is taken into account. The model shows that in times of high unemployment workers receive less training than in times of low unemployment. However, the implied odds ratio is fairly small: only 0.976 ($e^{-0.024}$) for each percentage point increase in the aggregate unemployment rate. After controlling for the aggregate unemployment rate in Model 2, the residual variance component at the period level further decreases from 0.028 to 0.025. The residual variance

component at the country level, by contrast, increases somewhat from 0.728 in Model 1 to 0.738 in Model 2.

Model 3 shows that the measure referring to the vocational orientation of the education system in a country significantly affects the likelihood of participating in continuing education and training. The higher the share of upper-secondary students in vocational education is, the higher the likelihood of training participation. Hence, in countries with a strong orientation towards vocational education, the participation in continuing education and training among the employed labour force is higher than in countries that mainly provide general education. This result clearly supports *hypothesis 2*, but falsifies *hypothesis 1*. Surprisingly enough, we do not find a decrease in the residual variation at the country level when we compare Models 2 and 3. Rather, we notice a small increase in the residual variation. With respect to the residual variation at the period level, however, we find a further decline in residual variation from 0.025 in Model 2 to 0.018 in Model 3.

To investigate changes over the life-course in the effect of the vocational orientation of the education system on training participation, we have investigated the statistical interaction terms of the measure regarding the vocational orientation of the education system and the age group variable (see Model 4). Figure 3 gives a visual representation of these interactions by presenting the main effects of the share of upper-secondary students in vocational education per age group. Interestingly, we find that the effect of the vocational orientation of the education system is significantly larger for older age groups. The difference in effect is largest between the oldest and

Figure 3. Impact of vocational orientation of education system on training participation by age group: logit effects



Note: The coefficients are from the interaction terms between age group and share of upper-secondary students in vocational education; main effects are included in the model, controlling for labour market cohort, level of education, sex, type of occupation, economic sector and aggregate unemployment rate (Model 4 in Table 1). *Source*: EU LFS 1993–2001, own calculations.

youngest age group. The effect of the vocational orientation of the education system on training participation increases from 0.152 for those aged between 15–24 years to 0.232 for those aged 54–65 years. This finding implies that we have to reject *hypothesis 3*.

Conclusion

In this study, differences in continuing education and training participation over the life-course of workers across Europe were investigated. We especially focused on the question to what extent initial and further education are complements or substitutes. In the empirical analysis, we used the European Union Labour Force Survey dataset for the period 1993–2001.

The results of this analysis showed that participation in continuing education and training varies considerably between European countries. Training participation among the employed labour force is highest in Scandinavia, the United Kingdom and the Netherlands. In Southern Europe, France, Belgium and Luxembourg, on the other hand, participation in continuing education and training is lowest. Consideration of the profile of training participation by age shows two patterns. First of all, in most countries participation in further education declines consistently from the youngest to the oldest age group. Second, in the Scandinavian countries, participation in continuing education and training increases with age reaching a peak within the 35–44 age group (in Denmark, the 25–34 age group) before falling off. Furthermore, differences in training participation between European countries are smaller for older age groups than for younger ones.

With regard to the interpretation of these cross-national differences in continuing education and training, we found that the higher the share of upper-secondary students in vocational education is in a country, the greater the likelihood of training participation there. In countries with a strong orientation towards vocational education, participation in continuing education and training among the employed labour force is accordingly higher than in countries that mainly provide general education. Moreover, the impact of the vocational orientation of the education system increases over the life-course of workers. It may be argued, however, that the sole emphasis on the impact of the vocational orientation of the education system in a country is somewhat misleading, since other institutional arrangements may matter as well, and can even explain the observed effect of the vocational orientation of the education system in a country on the training participation of workers there. But in that case, one should come up first with an alternative hypothesis that may counteract the theoretical arguments put forward in this study rather than doubt about the empirical evidence presented.

In conclusion, the results presented here reveal that further education is a complement rather than a substitute for initial education. Hence, the importance of continuing education and training for achieving the goal of

lifelong learning lies to a large extent already in initial vocational education. National education and training policies which aim at encouraging lifelong learning should therefore not only attempt to expand or redirect training received by experienced workers, but should also be geared towards facilitating participation in initial vocational education.

Appendix

Table A1. Number of cases analysed in each country-year combination

	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
Belgium (BE)	3695	3713	3754	3747	3800	–	–	4042	3957	26,708
Denmark (DK)	2349	2363	2401	2417	2468	–	–	2310	2365	16,673
Germany (DE)	–	–	29,437	32,044	31,816	–	–	30,954	31,463	155,714
Greece (GR)	3589	3648	3682	3722	3714	–	–	3814	3785	25,954
Spain (ES)	11,628	11,490	11,767	12,098	12,482	–	–	14,124	14,380	87,969
France (FR)	21,326	21,162	21,520	21,649	21,576	–	–	22,710	22,530	152,473
Ireland (IE)	1096	1144	1198	1246	1307	–	–	–	–	5991
Italy(IT)	19,252	18,965	18,827	18,911	18,862	–	–	20,168	20,793	135,778
Luxembourg (LU)	160	160	157	162	166	–	–	174	179	1158
Netherlands (NL)	5989	6081	6063	6200	6467	–	–	6022	6792	43,614
Austria (AT)	–	–	3492	3434	3437	–	–	3493	3500	17,356
Portugal (PT)	4267	4231	4198	4176	4233	–	–	4248	4626	29,979
Finland (FI)	–	–	–	–	2015	–	–	–	–	2015
Sweden (SE)	–	–	–	–	3492	–	–	–	–	3492
United Kingdom (UK)	23,712	24,939	25,210	25,423	25,802	–	–	–	–	125,086
Total	97,063	97,896	131,706	135,229	141,637	–	–	112,059	114,370	829,960

Source: EU LFS 1993–2001, own calculations.

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The author

Maarten H. J. Wolbers holds a doctorate in Sociology from the Radboud University Nijmegen, Netherlands. He is currently engaged as Assistant Professor in the Department of Social Research Methodology at the Free University Amsterdam. His main research interests include social stratification issues in general and school-to-work transitions in particular.

Contact address: Department of Social Research Methodology, Faculty of Social Sciences, Free University Amsterdam, De Boelelaan 1081, 1081 HV, Amsterdam, Netherlands. E-mail: mhj.wolbers@fsw.vu.nl